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FOR AND AGAINST SOIL MICROBES

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A radio talk by Dr. Henry G. Knight, chief, Bureau of Chemistry and Soils, delivered in the Department of Agriculture period, National Farm and Home Hour, Friday, January 6, 1933, broadcast by a network of 48 associate NBC radio stations.

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SALISBURY:

Dr. Henry G. Knight, the chief of the Bureau of Chemistry and Soils, today sends us another of his reports on recent results of research work by the chemists and soil scientists of the Department. Dr. Knight has told us of the results of research work which have given farmers assistance in growing, storing, and marketing of a long list of crops from tomatoes to cotton, from apples to hay. For the past four weeks he has been reviewing for us the new knowledge of soil science gained by research in the past two years. Today he continues to talk with us about the results of soils research, turning his attention to presenting the case for and against soil microbes as revealed by recent research. Ladies and gentlemen, Dr. Knight.

KNIGHT:

Thank you, Salisbury. My best New Year wishes to you Farm and Home Hour listeners.

Today I'm going to take you into one of the fields of scientific research where the amount of exploring to be done seems almost limitless, but where the promise of reward for careful scientific work also is exceedingly great.

You know, every grain of dirt carries a horde of bacteria, molds, protozoa, nematodes. It takes countless thousands of these tiny creatures to perform the very, very important function of reducing the decomposable material in and on the soil to simple forms which mix with the earthy matter and furnish the plant food for succeeding crops. Now as most of you know, the soil bacteriologists first concentrated their attention on the bacteria that go into partnership with the plants of the legume family to extract nitrogen from the air and thus add to soil fertility. One of the everyday jobs of our soil bacteriologists is the testing of the commercial cultures sold in this country for the inoculation of soils deficient in legume bacteria. These men have accumulated information through 20 years about the quality of the plant inoculants produced by different manufacturers. Any of you intending to buy legume inoculants can get the results of our examinations in terms of names of dealers in your vicinity handling inoculants which have given good results in the tests.

But I promised to give you the new knowledge of soil bacteriology which has come out of recent research. Well, our men have pushed back the frontiers of scientific knowledge concerning soil bacteria in two directions. One group of bacteriologists has gathered much more precise information than we ever had before about how bacteria take the organic matter returned to the soil and transform it into plant nutrients and that very important soil constituent-- humus.

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These men have recently learned that the materials plowed into the soil carry with them the bacteria that will decompose them and make them part, chemically and physically, of the whole complex of soil fertility. Do you see the importance of this knowledge? I am sure that you do. In the light of this fact it is probable that we will have to revise some of our ideas and plans about green manuring. While it is well known that green manuring on and acid soil, or an alkaline soil, or a neutral soil, will add plant nutrients and humus to the soil, the methods of handling green manures need to be adjusted to the new knowledge. Time will not permit me to discuss this important topic now.

We have recently shoved back another frontier of scientific knowledge about soil microbes. We have learned more of how the bacteria in the soil work to assist or hinder the growth and development of plants. You see, the idea used to be general among scientists that bacteria were spread uniformly throughout the upper part of the soil. But our bacteriologists last year found that the old idea was wrong. They went out and dug up some roots of corn plants. They studied the bacteria that came with the roots. They found that the surface of the roots and rootlets of the plant were simply swarming with soil bacteria. The numbers as they calculated them ran into the hundreds of millions to the gram, and remember it takes nearly 500 grams to make a pound. But, now mark this, the soil half an inch away from those rootlets of the corn plants contained very few organisms, comparatively speaking. The bacteriologists went on with tests and found that each little root of the corn plant manufactured a sort of a little zone of "corn soil." This zone extended only a part of an inch away from the rootlet, and the bacteria did not change the condition of soil beyond that limited radius. The organisms swarmed this zone around the roots of corn plants growing in sour soil, alkaline soil, neutral soil.

This discovery is way out on the frontiers of soil science. We have not yet established its exact meaning in the practical operations of farming but it points to the possibility of bringing about desirable microbiological conditions in our crop lands.

As usual in any scientific work, many by-products have come out of the work of the soil microbiologists. One of the by-products has been a great boon to some sufferers from the dread disease, asthma. Some of our bacteriologists discovered, as an incident of their investigations of soil organisms, that some of the molds found in the soil caused certain types of asthma. Physicians have taken up this discovery, and developed methods of testing patients to find out whether these soil molds caused their asthma; and have learned how to immunize them against the disease by applications of mold solutions.

The soil microbiologists, because they are acquainted with the little organisms coming from the soil that cause cotton fabrics to mildew, are helping the Department chemists to solve the problems of testing and preserving cotton goods from mildew.

A third instance of the by-products of soil microbiological research, and then I must leave you for this time. We have lately discovered that arsenic fungi in the soil can tear up the excess arsenic that reaches the soil from dust or residue from treatment used on plants to kill insects. These tiny molds turn the arsenic into soluble and gassy forms, so that part of it goes off into the air, and the rest leaches out with the fall and winter rains. This research

explains how under ordinary conditions arsenic falling on the ground disappears from the soil without causing harmful effects on the next crop. But--and here is the by-product--but this knowledge did open up a new set of fears. You know, arsenic may turn up chemically in a lot of materials, such as wall paper, building material, and so on. Some of these materials are built into our houses. Now if these materials happen to get damp and moldy in the house, the molds are likely to contain the arsenic bacteria which are capable of discharging those ill smelling and dangerous arsenical gasses into the air of the rooms. Cases of poisoning have been traced back to this cause. These findings give warning as to where to look for trouble and how to avoid it.

And with that final example of a by-product of research in soil microbiology, I must bid you goodbye. I shall return on next Wednesday, January 11, to bring you an account of recent developments in our soil erosion control work.

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